# ON JUDGMENTS OF "LIKE" IN DISCRIMINATION EXPERIMENTS.

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The class of judgments, which we in a general way term "like," have had a checkered career in experimental psychology. Originally more or less explicitly included by Fechner among his doubtful judgments in the Method of Right and Wrong Cases, they gradually acquired more and more expositive significance until we find them forming a basis for a logarithmic law of sensory memory (Wolfe) and for establishing a theory of recognition. (Lehmann.)

And the ontogenetic development of this class of judgments with a kindly consistency often follows the phylogenetic: reagents who, at the beginning of a series of experiments, rarely and hesitatingly set down the symbol for a "like" judgment—often in the later part of the work, come to express their convictions of likeness with underscored emphasis.

The factors whose presence in consciousness may bring about a judgment of "like" are probably numerous and certainly multifarious, and among them is a variation in tendency, noted by the writer in a previous investigation (*Phil. Stud.*, XIX, 19–20) to judge certain differences as like according to the variety in differences in value between norm and variable in the other comparisons of a series.

The existence of such a tendency was noted by Bruno Kämpfe in his experimental testing of the Method of Right and Wrong Cases (*Phil. Stud.*, VII, 548), and later on, the tendency appeared as a "by-product" from judgments on weights according to the Method of Constant Difference in Martin and Müller's "Analysis" (S. 22).

The object of the present investigation is a further analysis of this tendency in the hope of throwing more light upon this ambiguous class of judgments.

The scheme of experimentation for such an investigation is simple: a number of judgments, sufficiently large to serve as a basis for generalizing, is taken according to the method of constant differences with relatively small differences between norm and variables; this series is followed by a second containing some of the differences between norm and variable represented in the first, together with other and larger differences. The

second series is then compared with the first with regard to "like" judgments on pairs of stimuli common to the two series. If there are more "like" judgments in the second series than in the first the chances are that this has been brought about by the inductive influence of the larger differences; if in addition, the judgments of "like" are attended by a stronger conviction of likeness, the probabilities are very great that the effect is due to the presence of the larger differences. The apparatus used was the sound pendulum.[1]

The reagents sat, of course, with their backs turned towards the instrument and at a distance of about ten feet; they were wholly ignorant of the object of the experimentation and of the procedure. At the beginning of the work, the series with the small differences (A) alternated in the experimental hour with the series of large differences (B). Under these conditions, however, the reagents became aware of the transition from one kind of series to another, as was indicated by the confused nature of the results. Accordingly the remaining period of work was divided into halves, the first of which was taken with the judgments of small differences (A), and the second with the larger judgments (B). Under these conditions the reagents were not aware of the transition, and although in the course of the later series they became aware of greater ease in judging, they referred it, so far as they formulated their impressions at all, to practice, favorable disposition on a given day, or what not.

An hour's sitting gave a set of four series with ten judgments in a series. In two of these series the reagents were given full time to write down introspections; in the remaining two the pairs of stimuli succeeded one another rapidly without time for recording the result of any other introspection than the judgment. The object of this was partly to collect enough material for statistical conclusions, and partly to overcome the irregularities in methods of judging which constant introspection tends to bring about. The question to be answered was:—"How do differences in the scale of stimuli values affect judgments of "like"? and it might too easily come about that the native hue of comparison would be so sicklied o'er with the hue of introspection as to obscure the tendencies under investigation. At the same time the introspections in the alternate series might well serve as a check on the generalization from the figures. The order of the variable in a given series was first determined by chance—a fact with which the reagents were made acquainted; this order was reversed and repeated in sub-

[1] This instrument has its scale given in degrees. There is no reason why the readings should not give directly the fall-height of the pendulum bob.

sequent series until it had passed through all the conventional time-order and serial order changes, after which a new order was likewise determined by chance. The reagents noted their judgments according to the categories of "Louder clearly;" "Louder;" "Like;" "Softer;" "Softer clearly" and "Doubtful," the last named comprising the very few cases where a difference was perceived with the undetermined direction. The judgments of "like" were further divided into positive and negative according as they were attended by a conviction of likeness or resulted from an inability to perceive a difference. This list of seven categories of judgment is more formidable in logical analysis than actuality; the judgments themselves are unitary processes and the act which classifies them in no wise interferes with the processes themselves, in such a way for example, as would the injunction to watch the accompanying imagery.

Table I gives the general results in the two groups of experiments—group A with relatively small differences between norm and variables—group B with small and large differences. The average number of judgments for each of the four reagents is about 216 in group A, and 245 in group B. The difference in number of judgments in the two time orders is relatively small.

Taking now the number of judgments on the five variables common to the two groups, we find that group A (small differences) gives 147 "like" judgments in a total of 599 judgments of all kinds, or 24.5%, while group B gives 138 judgments of "like" in a total of 489 of all kinds, or a per cent. of 28.2. That is, the effect of the large differences mixed in with the small is to increase the proportional number of judgments of "like," even when working against the tendencies of practice. More clearly is this effect shown in the character of the "like" judgments; for in group A the underscored or clear judgments of "like" make up but 33.8% of the total number of "like" judgments, while in group B the corresponding proportion is 40.6%. That is, in the group containing the larger differences, the reagents delivered proportionately more "like" judgments and had proportionately clearer conviction of likeness. The excess of "like" judgments in the B group on the variables common to the two groups is, however, not large—not so large indeed as the writer expected, but the reason is not far to seek. In the case of one reagent the proportional number of like judgments was greater in the A group than in the B in the proportion of 33 to 30, while the number of underscored judgments was practically alike in the two groups. But seemingly in this case no less than in the other reagents the general trend of the series influenced the ways of judging. For

TABLE I.

*Number and kind of Judgments for each Variable and both Time Orders. Four Reagents. Norm equals 1.*

(*A*) *Small difference between Norm and Variables.*

| Values of Variables. | 0.7 | | 0.8 | | 0.9 | | 1.0 | | 1.1 | | 1.2 | | 1.4 | | 1.6 | | Totals. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time Order. | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| Louder Clearly | 1 | 12 | 1 | 12 | 4 | 16 | 2 | 3 | 9 | 1 | 9 | 1 | 19 | 1 | 22 | 2 | 67 | 48 |
| Louder | 1 | 33 | 5 | 18 | 18 | 29 | 31 | 22 | 12 | 8 | 20 | 4 | 19 | 5 | 16 | 2 | 122 | 121 |
| Like Clearly | 1 | 2 | 4 | 3 | 5 | 9 | 10 | 11 | 2 | 4 | 1 | 2 | 0 | 3 | 0 | 2 | 23 | 36 |
| Like | 2 | 2 | 9 | 5 | 12 | 18 | 15 | 15 | 11 | 8 | 10 | 11 | 3 | 9 | 1 | 2 | 63 | 70 |
| Doubtful | 0 | 2 | 6 | 3 | 3 | 3 | 1 | 5 | 2 | 2 | 1 | 6 | 1 | 0 | 1 | 1 | 15 | 22 |
| Softer | 18 | 1 | 14 | 3 | 24 | 10 | 10 | 21 | 6 | 14 | 0 | 18 | 2 | 12 | 1 | 24 | 75 | 103 |
| Softer Clearly | 32 | 0 | 5 | 0 | 14 | 0 | 2 | 2 | 4 | 6 | 0 | 2 | 0 | 14 | 0 | 10 | 57 | 34 |
| Sums | 55 | 52 | 44 | 44 | 80 | 85 | 71 | 79 | 46 | 43 | 41 | 44 | 44 | 44 | 41 | 43 | 422 | 434 |
| | | | | | | | | | | | | | | | | Total | 856 | |

(*B*) *Small and large differences between Norm and Variables.*

| Values of Variables. | 0.4 | | 0.6 | | 0.7 | | 0.8 | | 0.9 | | 1.0 | | 1.1 | | 1.7 | | 2.0 | | 2.6 | | Totals. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time Order. | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| Louder Clearly | 0 | 44 | 0 | 22 | 0 | 12 | 0 | 4 | 2 | 5 | 0 | 0 | 0 | 1 | 29 | 0 | 30 | 0 | 42 | 1 | 103 | 89 |
| Louder | 0 | 6 | 0 | 26 | 5 | 29 | 6 | 24 | 9 | 38 | 5 | 4 | 23 | 6 | 16 | 1 | 16 | 3 | 3 | 1 | 83 | 138 |
| Like Clearly | 0 | 0 | 1 | 0 | 0 | 1 | 3 | 6 | 11 | 10 | 4 | 7 | 6 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 34 |
| Like | 0 | 0 | 1 | 1 | 0 | 3 | 7 | 7 | 22 | 13 | 4 | 3 | 10 | 11 | 1 | 1 | 0 | 0 | 0 | 0 | 45 | 39 |
| Doubtful | 0 | 0 | 1 | 0 | 2 | 2 | 5 | 4 | 10 | 7 | 1 | 3 | 0 | 5 | 3 | 1 | 0 | 0 | 0 | 0 | 22 | 22 |
| Softer | 5 | 0 | 13 | 0 | 23 | 0 | 26 | 3 | 24 | 8 | 0 | 5 | 8 | 14 | 2 | 27 | 1 | 26 | 0 | 7 | 102 | 90 |
| Softer Clearly | 46 | 0 | 32 | 0 | 19 | 0 | 4 | 0 | 2 | 0 | 0 | 1 | 0 | 2 | 0 | 15 | 0 | 22 | 0 | 41 | 103 | 81 |
| Sums | 51 | 50 | 48 | 49 | 49 | 47 | 51 | 48 | 80 | 81 | 14 | 23 | 47 | 49 | 51 | 45 | 47 | 51 | 45 | 50 | 483 | 493 |
| | | | | | | | | | | | | | | | | | | | | Total | 976 | |

this reagent is what we might term of a positive or impulsive type of temperament; in the statements of his everyday conversation he rarely uses qualifying words, but adds them, if he deems it necessary, in a subsequent sentence. In the A series he underscored 60% of his judgments as against an average of 19% for the remaining three reagents. In the B series, however, with all its easily noted differences, his per cent. of underscored judgments was only 61, while in the case of the rest it rose from 19 to 36. In the case, therefore, of the impulsive reagent, the effect of the large differences was the reverse of what it was with the more deliberative type; starting out with a high degree of confidence in the correctness of his judgments this reagent was somewhat shaken in his confidence by the presence and obvious differences of the second series, so that he became more cautious and circumspect in his comparisons.

Reagent Co., on the other hand, is of a pronounced deliberative type; he is very careful in forming his opinions and cautious in expressing them. "It seems to me," "I think," or the deliverance of a judgment in the form of a question, are his usual ways in making statements. And as was to be expected, the effect of the course of the experimentation was the reverse of what it was on A. Not only did he have more "like" judgments in the B series than in the A, on differences common to the two series, but his proportion of judgments marked "clearly" was about eight times as great. (The actual figures are, A series, 1.8%; B series, 16%). That is, he not only had a greater tendency to judge "like" in the B series, but he had much greater confidence in his judgments, though he actually made more correct judgments of "like" in the series with the small differences, in the proportion of 28% to 16%.

Reagents Na. and Ya. come in between the extreme types Co. and Al. but approaching more closely Co. They represent the most common type among students.

We find here, therefore, two conditions affecting the number and correctness of judgments of "like:" 1° the Type: some individuals are more prone to express judgments of "like" than others, and this difference corresponds to the difference between deliberative and impulsive temperaments. This disposition, however, is not to be confounded with a tendency producing similar results with reagents who are not well-trained, viz., an inclination towards either judgments of "like" or of "unlike" as a result of a more or less vague notion of the general conditions of the experimentation. 2° The inductive effect of the course of the experimentation; series containing mainly large differences between norm and comparison call forth other judgments with given differences than those containing mainly small differences; the usual effect of the series with large differences is to increase the proportion of judgments of "like."

A third effect which has been clearly shown by previous investigations is that of time; the number and accuracy of judgments of "like" decrease with the time-interval between norm and comparison, though that this decrease always follows a logarithmic ratio, or that it is due to the "fading" of a memory image are in no wise matters of fact. The number of judgments of "like" fall off with the increase in time-interval because reagents maintain more constant bodily conditions in the short intervals than in the longer, and the accuracy falls off because there are fewer direct acts of comparison, though what the terms of these simple comparisons may be, to what category of sense they may belong, is not easy to determine. (*Vide* Hayden, Memory for Lifted Weights, *Am. Jour. Psy.*, XVII,

p. 497; Angell, Comparison of Shades of Gray, etc. *Phil. Stud.*, XIX, S. 20.)

In comparing simple stimuli like shades of gray or sounds, the usual process seems to be that reagents begin with negative judgments of "like;" that is, the judgment "like" is delivered because the reagents fail to note any difference between norm and comparison; and is not usually due at first to a conviction of likeness or a feeling of familiarity even after the reagents have begun to feel acquainted with the stimuli. Thus on the second day of the present investigation, a series of five comparison sounds were given without a corresponding norm, which the reagents were to compare with the norm used two days previously. At this time, although the reagents had made but 39 comparisons of sounds produced with the sound pendulum, these one term judgments were delivered in most cases quickly and often with considerable conviction of correctness. But in the subsequent judgments of this day there were no underscored judgments of "like;" that is, the judgments of "like" at this stage were still negative. It is at this stage, therefore, that these judgments are hardly distinguishable from the so-called doubtful judgments, and they further agree with the latter in taking a relatively long time in formation. In the course of time, however, this absence of a difference becomes a positive mark, so to speak, and such judgments are often delivered with more or less of a conviction of likeness. And along with this there grow up other positive signs which form bases for judgments of "like;" as the writer has before remarked (*op. cit.* S. 18.): "When a series of comparisons is made up of stimuli differing in part but a little, and in part not at all, from the norm stimulus, the judgment of "like" may be attended by a conviction of likeness which very often is due to the feeling, mood, tension sensation or even accidental circumstance."

In the present investigation the tension sensations were usually located in the ear; Al. notes repeatedly "muscular sensations in the ear," and Co. speaks of "reaction in ear." Resonance, referred sometimes to the external passages of the ear, sometimes to "echo" was frequently used as a basis for discrimination. In two cases, "a feeling of familiarity" with the norm formed one term of the comparisons, for Cl., the most experienced observer, and in another instance an organic sensation served the same purpose for Co. who notes that a 'thrill was experienced resulting from $R_1$ as significant, and this disturbance was held over till $R_2$ came.' The acoustic image of $R_1$ was not often noted, and when noted it did not seem to especially assist in discrimination. Cr. speaks of "A clear memory image but it did not help comparison." When held over

for comparison, the acoustic image frequently took some other form than that of its prototype: Al. several times says that the "memory image" is continuous between $R_1$ and $R_2$ and this continuous form of reproduction of momentary stimuli, is frequent in sound and tone discrimination.

It is evident that the judgments gotten from experiments of this kind with discrimination of such simple stimuli as sound and shades of gray can enter only in part, and perhaps in small part, into the construction of a theory of recognition. In the first place, most of the judgments of "like" in the early stages of the investigation must be excluded as inferences. Of course it was only at the beginning, if at all, that these inferences approximated an explicit form, such as "I perceive no difference, the stimuli must be alike." They quickly became more and more syncopated and condensed until they existed as an abstract state of knowing (*Bewusstheit*)— abstracted, that is, from any background of imagery or sensation, acoustic, motor or otherwise. But that in this vicarious form, many of the judgments were still essentially inferences, and not direct recognitions is shown by the inductive effect of the "unlike" judgments which formed, so to speak, the major premise for the condensed inferences.

Even with the absolute, or free judgments we have to do rather with cases of cognition or at best of class recognition than with the recognition of a specific impression. The experiment of the second day of this investigation (*vide* p. 258) when, after having delivered but 39 judgments on these sounds, the observers were able to compare stimuli with a norm given two days previously, shows how quickly the stimuli were classified.

It is further to be observed that in discrimination experiments where a definite plan of response to stimuli is set before the observers, a state of affairs ensues which is very unlike the ordinary conditions of recognition. There is, for example, a greater difference between discrimination of tones and the "absolute" recognition of a tone than lies in the relative number of terms of comparison. In his article, "Ueber das absolute Gehör" (*Z. f. Psy.*, III, S. 267) J. v. Kries writes that "In the first place it can come to pass that the hearing of a tone can produce in me immediately a certain name, say *c*, but nevertheless, I am left in a state of doubt as to whether I heard *c* or *d*. On the other hand, recognition is not excluded by the fact that in hearing a tone I feel no immediate impulse to give it a definite name." This is a very different mental condition from that of which Ach gives an account in his reaction experiments in discrimination. (Ueber die Willenstätigkeit und das Denken, S. 88.) He says, "After the sensation had developed, especi-

ally in the case of the colored cards, the name of the color in question, red or yellow, was mentally spoken with a certain affirmation or assent, after which the finger came up. In other cases blue or yellow was apprehended as colored according to the language of the instructions and after this the motion followed."

In the present investigation, the decision on the comparative loudness of the sounds, became practically a reaction or response to the second sound in terms of "louder," "softer," or "like;" these terms or some abstract equivalent for them were 'nascent,' to use a Spencerianism, and when the comparison sounded it was immediately thought of as under one of the catagories.[1] Occasionally it was classified by means of some sensory sign,—resonance for example, but usually the classification resulted without sensory or ideative basis.

How far beyond the conventional scheme of comparison these processes had gone is shown in the case of Observer Cr., who classified the sounds as unlike on the basis of a feeling of familiarity belonging to the norm—the recognition of one sound thus forming the criterion of a differerence. But the judgments of "like" in discrimination experiments with simple stimuli seem to be rarely recognitive; they are most usually based on inference or on cognitive classification, and when recognitive they are more apt to arise from imagery and sensations that are accidental than from the stimuli forming the direct objects of discrimination.

[1] *Cf.* Whipple, Discrimination of Clang3 and Tones (*Am. Jour. Psy.*, 12, p. 445)